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ABSTRACT

The School-to-Work Opportunities Act of 1994 mandates standards-based assessment and skills certification as an integral part of a comprehensive school-to-work (STW) system. An ideal STW assessment system would span elementary through postsecondary education and culminate in assessment of skills at the workplace. It would articulate in progressive and logical fashion and reinforce and measure individuals' proficiency with respect to agreed-upon standards. Skills assessment development and implementation must involve a partnership of educators and industry representatives. Starting in high school, however, industry must assume more responsibility and ultimately assume the lead. An ideal STW assessment and certification system would include assessment of the following skills in the following settings: academic and general workplace skills in middle school; academic, general workplace, and industry core skills in grade 10; academic, general workplace, industry core, and occupational family skills in grade 12; and academic, general workplace, industry core, occupational family, and specific occupational skills in higher education and the workplace. The ideal STW assessment model would recognize differences between education's and industry's perspectives on key assessment issues (including standards, accountability, legal defensibility, multiple measures, cost, marketing, and portability) and bridge those differences to pave the way for successful industry-education partnerships. (Contains 30 references.) (MN)

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Improving Education through Research, Development and Service

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The Ultimate School-to-Work Challenge:
Linking Assessment in School and the Workplace

by
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The school-to-work (STW) movement is an ambitious reform agenda aimed at improving the preparation and performance of young people for the world of work by strengthening the relationship between school and work. Advocates in the business and education communities agree about the need for coherent state and local school-to-work systems that span across the educational system from kindergarten to community college, or university, on through to the workplace. The School-to-Work Opportunities Act of 1994 (STWOA) is a far-reaching law that establishes a national framework for the development of such systems, providing venture capital to underwrite the initial costs of planning and establishing such systems.

With or without the direct support of the STWOA, several efforts to build school-to-work systems are well underway across the nation. In this process of planning and early implementation, it has become clear that many states and local partnerships have significantly underestimated what it actually takes to build a comprehensive school-to-work system. Several authors are beginning to address the many challenges and barriers faced in design and implementation of a comprehensive STW system (National Governors' Association, 1996). The complexities around building sustainable education-industry partnerships alone are forcing many state and local partnerships to reconsider their designs and timelines for implementing comprehensive STW systems (Hershey, et. al., 1997). Given this reality, other key components of a comprehensive STW system, such as assessment, have yet to receive concerted attention.

The STWOA recognizes that assessment must be an integral part of a school-to-work system in order to properly gauge system effectiveness and student progress. Moreover, it specifically calls for standards-based assessment systems that promote skill certificates. These certificates are to be industry-recognized, portable credentials that are issued by a state-approved STW program (Wills, 1997). To date, few states have even attempted to develop such a STW assessment system. There is a dearth of agreed upon STW assessment models, few resources devoted to their development, and little progress on this front in general. Thus, the time has come for serious attention to viable STW assessment models, beginning with an examination of current assessment-related issues and practices in education and industry.

A comparative analysis between education and industry with respect to assessment has relevance to STW as well as to education and industry independent of STW. For example, there is currently a scarcity of standards-based models and tools to assess the skills of entry and expert level workers for various occupational clusters and industries. An examination of current assessment practices in education could help inform industry

on the design of standards-based instruments. Similarly, a comparative analysis could help education learn from industry's experience, particularly with issues around performance-based assessment.

Beyond presenting a comparative analysis of assessment in education and industry, this paper is intended as a "wake up" call to the field that much work remains if we are to successfully incorporate STW assessments and certification as part of our current efforts to develop comprehensive STW systems at the state and local levels. This is no easy undertaking; it will require intensive planning and significant resources and more debate on assessment forms and purposes, as opposed to the rhetoric and half measures that seems to dominate current treatment of this key STW component. The paper begins with a vision for an articulated STW assessment system. Then, it analyzes the different perspectives and practices of education and industry on key assessment issues that challenge the design and implementation of such a system. Finally, the paper identifies the conditions—structures, mandates, and technical considerations—that are necessary for successful implementation of a comprehensive STW assessment system.

An Ideal School-to-Work Assessment System

An ideal STW assessment system would span elementary through postsecondary education, culminating in assessment of skills at the workplace. It would articulate in progressive and logical fashion, assessing performance at key junctures in an individual's education and training in order to reinforce and measure that individual's proficiency with respect to agreed upon standards. In the educational arena, skills assessment development and implementation should always involve a partnership of educators and industry representatives (as well as parents and the broader community). However, starting in high school, industry must take on more responsibility and ultimately assume the lead. This is consistent with the STW and skill standards movements, both of which espouse that standards and assessments must be industry driven in order to have credibility and validity for career applications.

A model for an ideal STW assessment system is offered below. First described elsewhere (Ananda & Rabinowitz, 1995), and expanded upon here, the system reinforces instruction and training in the knowledge and skills required at different points in an individual's career preparation, reflecting the objectives of both education and industry. Figure 1 illustrates such a system, specifying the targeted standards and skills, certification status, and partnerships appropriate for each point of assessment. A brief summary of this idealized system follows.

Elementary and Middle School

Targeted Standards and Skills. With career awareness instruction beginning in elementary school, assessment of skills that are transferable to the workplace should start by middle school. At this point, instruction should be on building academic foundations

FIGURE 1
Ideal School-to-Work Assessment and Certification System

Assessment Level	Targeted Standards and Skills*					Certification Status	Assessment Partners**
	Academic	General Workplace	Industry Core	Occupational Family	Occupational Specific		
Workplace	X	X	X	X	X	Occupational Certification	*Industry* / Education
Higher Education	X	X	X	X	X	Occupational Certification	*Industry* / Education
Grade 12	X	X	X	X		Certificate of Advanced Mastery	*Education* / *Industry*
Grade 10	X	X	X			Certificate of Initial Mastery	*Education* / Industry
Middle School	X	X				None	*Education* / Industry

*definitions of targeted standards:

- *academic standards* cover subject matter areas, such as mathematics, language arts, and science
- *general workplace standards* cover those generic skills and qualities that workers must have to learn and adapt to any job, such as personal attributes, interpersonal skills, and use of technology
- *industry core standards* apply to all or nearly all occupations in a particular industry; for example, all workers in the health care industry need to have knowledge of health care delivery systems, legal responsibilities of health workers, and health maintenance practices
- *occupational family standards* specify the knowledge and skills that are common to a related set of occupations or functions within an industry; for example, occupations in medical laboratory, imaging, and radiography belong to a larger diagnostic family of occupations within the health care industry
- *occupational specific standards* address the skill expectations of a specific occupation; for example, Certified Nursing Assistants must demonstrate that they can understand and measure patients' vital signs

**lead partner for assessment development and implementation is indicated by italics

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required for full participation in society, including employment and citizenship. The academic curriculum should also infuse career-related themes and concepts, such as quality control in science education and teamwork in social studies. To reinforce such learning, assessment should focus not only on academic skills, but also general workplace readiness skills that help provide students with a solid life foundation, and are often excluded from the traditional academic curriculum. These general workplace skills address what workers must have in order to adapt to the demands of any occupation, such as interpersonal skills, applying technology, and personal responsibility.

Certification Status. Assessment of the targeted skills can occur as part of the ongoing academic testing program and should *not* entail formal certifications or sanctions for students. In addition to traditional paper-and-pencil assessment tasks, use of assessments such as portfolios and teamwork exercises at this level should help reinforce both academic and general workplace readiness skills.

Assessment Partners. Primary responsibility for assessment remains at the local rather than the state level, with educators in the lead. Although formal career-related certification is considerably premature at this level, community or industry groups should participate along with educators in development or review of the assessments. This will help facilitate the infusion of real-life applications with academic content.

High School

Two distinct levels of formal assessment and certification should be offered in high school, as described below.

Grade 10

Targeted Standards and Skills. Many states stipulate that students should complete their core training in key academic subjects (e.g., mathematics, science, language arts) by grade 10. As with the middle school level, assessments at grade 10 should focus heavily on academic concepts. Nevertheless, students at this level should be exposed to general workplace readiness, such as those identified by the Secretary's Commission on Achieving Necessary Skills (SCANS). SCANS (1992), which is perhaps the most well-known effort to identify general workplace skills, has identified three foundation skills (basic skills, thinking skills, personal qualities) and five key competencies (resources, interpersonal, information, systems, and technology).

SCANS-like skills are often introduced in career-technical foundation or core courses, such as business administration core or health careers core. Such core courses also target industry core standards, that is, standards that apply to all or nearly all occupations in a particular industry. For example, a health careers core class would typically address the SCANS-like skill of teamwork, but in the context of the health care industry and as a health care core standard. As an alternative vehicle for teaching broad workplace skills, some states and local districts are requiring that students take a general "workplace/career

skills" class. This may be a less effective way of teaching general workplace skills because of the non-contextualized nature of such classes. At any rate, assessments at grade 10 should reinforce attainment of general workplace readiness and industry core skills.

Certification Status. Some states are planning to issue *Certificates of Initial Mastery* (CIM) to recognize achievement in key academic subjects. These certificates are intended to assess and reinforce the achievement of a strong academic base, ideally by grade 10 and certainly by high school graduation. This process of certification shifts substantial responsibility for development of formal assessments from the local to the state level. Comprehensive STW systems should expand upon current CIM assessment models from their core academic base to include assessment of general workplace readiness skills and the introduction of career preparation focusing on a particular economic sector or industry (e.g., industry core standards). The primary objective of the expanded Certificate of Initial Mastery is to help ensure that students are exposed to information about broad career options early on in high school and hence do not limit their future options due to inadequate information or academic training. Nevertheless, academic preparation should still be the primary driving force behind CIM because academic foundations form the basis for so much subsequent learning. Again, a combination of traditional paper-and-pencil tasks as well as more innovative assessment techniques would allow the student to demonstrate mastery in different ways.

Assessment Partners. Educators should take the lead in assessment development and implementation, although assessment development teams should also include parent, civic, and industry representation in order to secure valuable input as well as the necessary "buy in" for the certification process.

Grade 12 (Exit)

Targeted Standards and Skills. The focus should be on advanced academic skills (e.g., technical writing, literary analysis, geometry, biological sciences) that are reinforced, where appropriate, in the context of a career specialization. Many recent school-to-work models stipulate that academic training after grade 10 should be integrated within the context of an occupational family (e.g., agriculture science, food services) or career cluster. For example, career academies built around industries ranging from health to electronics represent a specialized attempt to combine academic and career training into meaningful student-based experiential learning (Stern, Raby, and Dayton, 1992; Linnehan, 1996).

In general, high school exit assessments should focus on broad career preparation within or across industries (i.e., the occupational family), including strong emphases on self-directed learning and academic achievement. This broader preparation will better serve youth in the long run because it will give them the flexibility needed to adjust to the changing workplace and accompanying changes in specific job demands and requirements. For a high-school student, job-specific training may be too narrow and

may limit the student's later options. With a few notable exceptions, such as auto mechanics, occupation-specific training and assessment should be the focus of higher education and the workplace, rather than high school.

Certification Status. Whereas grade 10 certification focuses on academic foundations, general workplace readiness, and industry core skills, at or around grade 12 students could pursue a more advanced level of certification that demonstrates mastery of a more specialized level of academic and technical knowledge and skill relevant to an occupational family. States such as Oregon refer to this level of high school certification as *Certificates of Advanced Mastery* (CAM). While Oregon's CAM currently focuses more on advanced academic rather than career specialization skills, the concept of the expanded Certificate of Advanced Mastery presented here would actively support both options. That is, Certificates of Advanced Mastery could be offered in humanities (e.g., for college-bound liberal arts majors) or occupational families, such as graphic design, bioscience, or electronics. In Oregon, development of endorsement credentials are currently underway, providing an option for students to be recognized for in-depth career-related study.

The Certificate of Advanced Mastery may allow for greater use of performance-based assessment (e.g., projects, portfolios, demonstrations) than the Certificate of Initial Mastery. As compared to the more general Certificate of Initial Mastery, fewer students may be prepared to pursue Certificate of Advanced Mastery in career-related fields. Lower numbers can mean more manageable assessment administration and scoring demands, thereby making performance-based assessment methods a more feasible option. Moreover, the more specialized preparation within an occupational family provides greater opportunities for performance-based assessment. For example, students at this level have more career-related content knowledge to develop long-term projects (e.g., patient case studies in health careers; comprehensive marketing plans for business administration) that can serve as assessment tasks. Finally, students' advanced training often includes paid or unpaid on-the-job experience which also lends itself to more "hands on" performance assessment (e.g., job/work samples).

Assessment Partners. As compared to earlier grade levels, the career specialization at grade 12 suggests that industry must take a more active role in assessment development and implementation. For example, employers and workers could help design and evaluate more "authentic" assessment methods that reflect workplace practices and needs, such as projects and work samples. At this point, there must be full buy in from both the education and industry partners. In this way assessments can be closely tied with industry expectations but still have fidelity to classroom curriculum and practices. In addition, parents and the broader community should be involved in the assessment development and implementation process.

Higher Education

Targeted Standards and Skills. A traditional focus for community college curriculum is on occupational specific training (e.g., nursing assistant, welding, drafting). However, training at this level is also broadening to include fundamental preparation in a specific industry (core curriculum) or occupational family to help prepare students for horizontal and vertical movements in their targeted career areas. In addition to high level academic skills, assessments at this level should encompass general workplace readiness, occupational family, and occupational specific skills, as appropriate.

With the notable exception of professional schools (e.g., education, engineering, business), the four-year colleges and universities have traditionally played a less active role in articulated career preparation. Career preparation is often perceived as inconsistent or even at odds with a liberal arts curriculum. However, the school-to-work movement is beginning to make important in-roads in involving such institutions in state and local school-to-work partnerships. Boeing Company, the number one aircraft manufacturer world wide, provides an example. Its STW training program in Washington state expands the traditional tech-prep concept (i.e., an articulated high school/community college program) to include an option for transfer to a four-year institution, Western Washington University (Packer, et. al., 1996).

Certification Status. Higher education should directly prepare students for various types of occupational certification, including technical (e.g., radiological technician) and professional (e.g., accounting). Certification should involve multiple modes of assessment, for all the reasons alluded to previously.

Assessment Partners. At this level, the links between education and industry need to be strongest because this is the major point of transition into careers for an increasing number of individuals. For the first time in the educational/training process, industry should drive the assessment development and implementation process, with full participation of educators and other stake holders.

Workplace Skill Assessment

Targeted Standards and Skills. Success in the workplace requires proficiency on a full range of skills. At this level, there is little need to distinguish between academic, industry core, or occupational family skills; all contribute to success in a specific occupation.

Certification Status. Entry into many occupations is regulated through certification and licensure processes. The assessments used for certification and licensure typically are called for and supported by professional associations, as well as the state and federal governments. Many well-established certification programs, such as the National Institute for Automotive Service Excellence and the American Institute of Certified Public Accountants, rely heavily on multiple-choice assessment because of the many advantages associated with this assessment methodology. Multiple-choice items afford

broad coverage of content over a relatively short amount of time, have a strong empirical history with demonstrated technical quality, and are easy and relatively inexpensive to administer. These qualities are very appealing to large-scale certification efforts. In contrast, many programs have found performance-based assessments to be preferable but cost prohibitive (Wills, 1994). Several existing certification systems, such as the Certified Public Accountant's exam (maintained by the American Institute of Certified Public Accountants) augment their multiple-choice components with essay or selected performance-based assessment tasks.

Job entry is but one application of assessment for the workplace. For example, training or retraining is being offered at the workplace for new and incumbent workers. Assessment at end of training helps to gauge the effectiveness of the training as well as the skill level of the individual worker. As work site training is often short term in nature (e.g., two days to six months), incorporation of time-intensive assessment tasks, such as portfolios, may not be feasible. Instead, on-demand or "on the spot" assessments that can be administered in a limited period of time may be more appropriate. This could include multiple-choice examinations, essay type examinations, or direct observations of work.

Likewise, workers in any industry are subject to periodic review, typically by their immediate supervisors and sometimes by their peers. Performance review should be based on explicit criteria of which both the supervisor and employee are aware. These criteria might include company standards or more broadly validated standards, such as the national industry skill standards that have been developed and validated by various industries with support from the U.S. Departments of Labor and Education as well as the National Skill Standards Board (National Skill Standards Board, 1996). Finally, assessment of an individual's skills can be used as evidence to help "make the case" for an individual's career advancement or promotion. For both performance review and promotion, a collection of an individual's work samples, such as a portfolio, could provide a useful tool for performance evaluation.

Assessment Partners. For all workplace assessment applications, industry clearly needs to be the driver in developing and administering such programs. However, education should participate in certain applications, such as certification for job entry. Involving educators would allow them to better understand the skills coveted by industry. They can then bring back this knowledge to help ensure that what occurs during the formal education process is better linked to workplace needs.

Key Differences in Perspectives and Practices between Education and Industry

The ideal STW assessment system described above envisions students as prospective workers and workers as ongoing students (WestEd, 1998). Within this system, assessments can measure progress, support the developmental nature of education and training, and provide an accurate picture of workforce readiness. It can also help close the gap between education and industry contexts in terms of their goals and how

assessments are used to support these goals. However, in order to achieve a fully articulated STW assessment system, we need to better understand and take into account the similarities and differences between education and industry with respect to existing assessment practices and perspectives. Interestingly, what may on the surface appear to be similarities play out differently in education versus industry. For example, while there is agreement that assessments should be grounded in high standards, there are real differences in how the two define high standards. Moreover, while both education and industry are driven by legal defensibility concerns, what constitutes evidence of validity in support of legal defensibility differs in subtle ways between the two. This section explores the differences in perspectives and practices of education and industry on key assessment issues, including standards, accountability, legal defensibility, multiple measures, cost, marketing, and portability.

Focus on Standards

The movement is well underway in both education and industry to set high performance expectations for students and workers. This has entailed development of systems of (1) academic standards specifying what students should know and be able to do in kindergarten through grade 12 (or even 16) and (2) industry skill standards that specify the knowledge and skills needed for successful preparation and performance of workers in certain occupations and industries. Both systems represent an expansion of older competency-based standards systems. The key notion underlying these newer standards-based reform movements is that setting high expectations for all students or workers is a fundamental step to improving their achievement levels. That is, if you provide support for individuals to reach these expectations and then hold them accountable, they will perform.

While there is a strong sense among both educators and industry representatives that assessments should be linked to challenging standards, there is *no* consensus across education and industry lines about what constitutes appropriately challenging standards. On the education side, the focus is on setting high standards in academic content areas. Several sets of national standards in various content areas have been released in recent years, including mathematics, history, geography, civics, social studies, science, English/language arts, and foreign languages. Some of these efforts have generated lively debate. For example, an early version of the national history standards developed by the National Center for History in the Schools based at the University of California in Los Angeles, met with widespread criticism in 1995 for downplaying the role of Western civilization. The revised version of the standards released in 1996 met with much more positive reviews in the educational and broader communities.

Regardless of the controversial nature of some of the national academic standards efforts, on the whole, the recently developed standards reflect more problem-solving and analysis, and hence are more challenging than those produced in previous times. For example, the widespread emphasis on minimum competency testing in our nation's schools in the 1970s and 1980s demonstrated our priority at the time of students' achieving minimally

acceptable levels of skills or standards. While the emphasis has now shifted to high levels of standards, the standards reform movement in the education community still focuses the lion's share of attention on academic content areas. Applied learning, service learning, and career preparation are only recently beginning to receive some attention (New Standards, 1995; Council of Chief State School Officers, 1997).

In contrast, occupation- or industry-specific skill standards drive assessment for the work place. Industry skill standards are industry-validated sets of standards making explicit what knowledge, skills, and performance levels workers need to achieve in order to be successful in a particular job, occupational family, or industry. Over the last four years, efforts to develop national skill standards for more than 20 industries have received support from the U.S. Departments of Education and Labor as well as the National Skill Standards Board[1].

While industry is beginning to embrace skill standards, to date, the reaction by educators has been mixed. Skill standards are considered by a number of educators to inadequately reflect high level academic knowledge and skills. This was a prevalent viewpoint among educators as expressed at a key meeting of academic and industry skill standards developers and users in Harriman, New York in summer 1996 (Bailey, 1997). At this meeting, it became clear that many educators view skill standards in a secondary position to academic standards, that is, as a tool for reinforcing academic skills. For example, measurement tasks or problems in manufacturing can help reinforce mathematics achievement by providing hands-on or "real life" applications. Given this perspective, the more academically challenging the skill standards, the better. Fidelity to the needs of the workplace is not the primary consideration.

However, from the industry viewpoint, skill standards must reflect directly what is needed in the work place. Although employers want their workers to meet challenging standards, they are also legally bound to using standards that reflect actual job requirements. For example, if the job in question does not currently require high levels of written communication, problem solving, science, or mathematics skills, then workers cannot be held to those standards for job entry. Industry-driven standards must be grounded in current practice and cannot embody lofty goals that are not supported by practice, as advocated by some educators. To embrace standards or assessments that go beyond current practice is to leave an employer vulnerable to legal challenge (see discussion on legal defensibility below).

However, what constitutes current practice in many workplaces is changing. Increasing numbers of companies are ascribing to the model of a "high performance workplace," demanding new skills and abilities of workers. Companies that follow a high performance model share many of the following characteristics: strong goal orientation, emphasis on quality, performance, and continuous improvement, decentralization of authority and responsibility, more direct worker control over job outcomes, and more

[1] The 1994 National Skill Standards Act charged the National Skill Standards Board with "stimulating the development and adoption of a voluntary national system of skill standards."

comprehensive formal and informal education programs (Nash & Korte, 1997). The emergence of the high performance workplace will help set the stage for more challenging industry skill standards.

Accountability

In both the educational and industry arenas, assessments serve an accountability function, that is, to ensure that goals are met. For education, student assessment provides a yardstick by which to hold schools, teachers, and students accountable for achieving agreed upon levels of student achievement or performance. In the workplace, the employer is accountable to the client or consumer for service or product quality. Employee performance and productivity must support this accountability. Thus, assessments of an individual employee's performance provide useful tools for hiring, performance review, and promotion decisions.

While accountability is key to assessment in both arenas, the nature of that accountability is very different, driving assessment in distinct ways. For example, at the elementary and middle school levels, the primary role of assessments is to help ensure that students are ready for the next level of education. Hence, the focus is upward, or towards the future, measuring progress as students climb the educational ladder. At the same time, educational assessments are also supposed to serve a general diagnostic function, such that results can be used to signal the need for possible targeted help and remediation for specific individuals so that they may progress to the next levels of education.

In contrast, assessments used for the workplace -- particularly occupational certification-- are intended to ensure that workers possess the skills necessary to do the job. They serve to protect the employers' and the general public interest by screening out unqualified workers. As such, the focus of accountability is on the present, rather than on the future: Does this individual currently possess the skills necessary for success on the job? Moreover, the diagnostic function of assessments does not figure as strongly into the accountability equation as it does for educational assessment. Whereas evaluative reporting of assessment results is demanded by schools and parents on the education side, employers are not making such demands of occupational certification.

The differences in accountability functions are reflected in how education and industry view certification. For industry, occupational certification has traditionally been defined as a process of demonstrating knowledge and skill in a given specialization area for the purpose of maintaining minimal ethical and performance standards. Thus, certification in industry connotes minimal standards, whereas certification in education connotes higher standards (Mulkey & O'Neil, 1997).

Legal Defensibility

Assessments in education and industry are subject to an array of legal challenges. This is particularly true when high stakes are attached to assessment results, such as whether or

not to certify a worker for occupational competence or graduate a high school student. The types of legal challenges high stakes educational and workplace skill assessments face are comparable in many ways. For example, substantially lower performance on assessments by historically disadvantaged groups as compared with others frequently form the basis of challenges to which high stakes assessments are vulnerable.

In educational and workplace skill assessment, group differences in performance in and of themselves do not signify unfair or biased assessment tasks. Standard practice now includes use of statistical and judgmental methods to further explore possible bias against ethnic groups or by gender (e.g., statistical comparisons of group performance that control for ability level; review of assessments by groups of content experts with substantial representation from minority groups). On the industry side, claims of "disparate impact" or unfair negative effects on a specific group (e.g., minorities, women) need only demonstrate that the particular group has been significantly disadvantaged by an assessment or other employment practice. A substantial body of literature on such group differences as well as the question of "test fairness" has emerged from assessment activities conducted in the military setting (Baker & O'Neil, 1994).

Legal defensibility also requires evidence of validity--that the specific inferences made from assessment scores are appropriate, useful, and meaningful. Criteria for validity have been developed by the joint committee of the American Educational Research Association, American Psychological Association, and National Council on Measurement in Education (1985). These criteria are currently undergoing extensive updating and rewriting.

Currently, both education and industry focus on *construct* and *content-related* aspects of validity for purposes of legal defensibility: Are score inferences consistent with theoretical concepts that account for performance and relationships with other variables? Is the content assessed representative of the targeted behavioral domain? However, courts have looked for somewhat different evidence of validity for high school graduation tests as compared with licensure or employment tests. For example, the need to demonstrate *opportunity to learn* and *curricular validity* distinguish high school graduation tests from tests used for employment purposes. The landmark *Debra P. v. Turlington* case in Florida challenging the state's minimum competency requirement for high school graduation set the stage for both requirements (Phillips, 1995). That is, the decision in that case set forth that group differences in student performance likely reflect disparities in students' opportunities to learn the content covered by the test and set the requirement that diploma tests demonstrate curriculum relevance and representativeness.

In educational circles, validity investigations are now shifting to include emphasis on consequences of assessment on practice. This is referred to as *consequential validity*. To date, there is little attention to consequential validity in industry-driven assessment and certification.

While demonstrating content validity is crucial for both educational and employment tests, the courts have been particularly insistent that assessments used for employment purposes demonstrate a logical and empirical relationship between job requirements and assessed knowledge and skills. As Knapp (1995, p. 18) argues: "At this time, content validity is the method of choice for documenting the validity of credentialing examinations." Thus, the content domain to be covered by a certification test should be explicated and justified in terms of the importance of that content for competent performance. Legal guidelines and accepted standards of practice point to job analysis as the means for generating detailed information about the tasks job incumbents perform and the knowledge and skills required for competent performance.

Multiple Measures

Assessments in both industry and education are moving towards inclusion of multiple measures. The accumulation of multiple forms of assessment evidence to reach a decision, such as certification, is referred to as triangulation. Triangulation allows for assessment of skills through multiple and complementary means, thereby helping to increase the reliability of the resultant score and any decisions made from this score (Mathison, 1988). Using a variety of assessment components and methods allows examinees to demonstrate competency in different ways, capitalizing on each individual's areas of strengths, and satisfying equity and other legal concerns described above. While both industry and education are making concerted efforts to include innovative assessment tasks and methodologies, neither is abandoning multiple-choice items as an integral part of an overall assessment system. Both recognize that multiple-choice assessment tasks have a history of careful empirical development and are an efficient way to cover a large number of standards.

Where industry and education differ is in the types of non multiple-choice assessment tasks on which they are currently focusing. For example, portfolios, or purposeful collections of student work, enjoy strong popularity as an alternative assessment method in education circles. With the exception of some of the professions (e.g., architecture, teaching), use of portfolios is not as widespread in industry. In fact, employers have expressed reservations about the feasibility of portfolios as a tool for many workplace assessment purposes, such as screening of potential applications (WestEd, 1998). A specific concern is that employers may not have the time to screen hundreds or thousands of portfolios to fill a specific position. Instead, employers are more interested in work samples, simulations, and observations as more discrete and efficient non-multiple choice assessment tasks.

Whether for education or industry, the multiple measures approach to assessment presents important technical choice points and considerations. For example, how should assessment results be reported, as a single score or profile? What is the most appropriate weighting scheme for the various assessment components? How should scores be equated?

Cost

Two key cost questions related to assessment are: *Who pays?* and *How much?* In the education arena for the K-12 system, costs for assessment development, implementation, and administration are typically the joint responsibility of the state and local districts. Particularly for certification issued at the state level via the schools (such as the Certificates of Initial and Advanced Mastery), the costs of assessment leading to such decisions should be the primary responsibility of the state (Ananda & Rabinowitz, 1995). Students do not and should not be expected to bear the brunt of costs for assessment and certification because this may limit some students' access to certification. A notable exception includes the fees charged to students for assessments such as those used for college entry, like the Scholastic Achievement Test (SAT), or those used to award college credit, like the Advanced Placement examinations.

Assessments for the workplace are currently supported by specific industries, professional organizations, employers, and individual candidates. For example, professional and trade organizations support a number of certification programs that then, in turn, charge fees to individuals interested in becoming certified. At the work site, many employers use their own resources to develop and administer tests to screen potential candidates for vacant positions.

The actual costs for assessments vary widely and are hard to gauge. Costs depend on the number of test takers, number, nature, and length of responses to be evaluated, the number of scorers, the number of topic areas to cover, the number and types of reports to be produced, and the inclusion of preparation and support materials. Moreover, some of the costs related to assessments are absorbed into other ongoing efforts, making them hard to estimate accurately. For example, the costs associated with school-based assessments, such as teachers' time spent in preparation, administration, and scoring are typically incorporated into schools' regular operations and not priced out separately (Linn & Herman, 1997). Such "hidden" teacher costs are also associated with the cost of "lost" teaching time.

What is clear is that assessments that require constructed responses are typically costlier than multiple choice tests. While the latter can be machine scored, constructed response items must be judged by individual raters (e.g., employers, teachers, content experts). Administration of a machine-scorable test at a school site may cost between $5 - $10 per individual, depending on the volume of tests and the scoring services required. Some estimates are even lower. For example, the prorated cost of one class period of multiple-choice science assessment was reported as $1 per student (Comfort, 1995). In contrast, student assessments that involve short answers and extended written responses can cost more than two to three times as much, while those including hands-on tasks can range from $30 to $70 per student (Linn & Herman, 1997; Stecher et. al., 1997). This does not include operational costs for schools, districts, or states. On the industry side, candidate fees for becoming certified (for example, travel agents, insurance brokers, teachers, psychologists) range from $75 to $2,000 (Knapp, 1995).

A promising avenue for limiting assessment costs in both the industry and education arenas is the computer-based approach. Computer-based administration, scoring, and reporting of performance assessments may be the most time and cost-effective way of using open-ended and innovative assessment methods. For example, the Center for the Research on Evaluation, Standards, and Student Testing (CRESST) has done a substantial amount of work in investigating the feasibility of using networked computers to capture and measure team competencies for individual students and teams (O'Neil, Chung, & Brown, 1997).

As we begin to build articulated STW assessment systems, attention will need to focus on avenues for financing the new forms of assessment. A commonly held view is that the employers should shoulder more of the responsibility for this type of assessment because they would have a better prepared workforce, which would save on training and retraining costs. However, the reaction by the employer community to date on financial support for STW and work-related certification has been mixed (Wills, 1997).

Public Engagement and Marketing

Securing broad-based support and involvement is key to the success of high-stakes assessments in education and industry. In the education arena, "public engagement" -- the process of informing the public and securing buy in for assessments -- is more critical now than in the past, particularly as more and more states and local districts begin incorporating innovative assessment tasks as part of the overall student assessment system. A number of states, like California, have underestimated the time and effort required to engage the public and reach consensus around what is important for all students to learn and demonstrate. A circumventing of the process there led to charges of elitism, secrecy, and failure of the assessments to reflect community values. This public relations fiasco a few years ago ultimately contributed to the demise of California's statewide student assessment program, the California Learning Assessment System (Kirst & Mazzeo, 1996). Ironically, this need for greater public engagement emerges at a time when assessment development timelines seem to be getting shorter and shorter.

For workplace skill assessment, employers to a large extent are in the driver's seat. They must be convinced of the direct effect of assessments on the bottom line. That is, does the use of skill assessments help to predict or identify the most productive employees? Will the investment in assessments ultimately result in reduced costs or increased productivity for the company?

In summary, for both education and industry public engagement or marketing should be recognized early in the planning process as a critical activity in the development and implementation of assessment system.

Portability of Certification

Historically, the issue of portability of certificates or credentials has been of greater concern in industry than in education. (However, one could argue that current efforts to raise academic standards and the assessments on which they are based represent an attempt by policymakers and the public to increase the portability of the high school diploma.) For the most part, the business community supports centralized, nationalized skill standards and assessment systems (Wills, 1997). Having skill credentials that are portable across geographic boundaries makes the screening and hiring process much more efficient for employers. For workers in a given occupation or profession, portable certification means widespread recognition of their skill level. Furthermore, public interest and safety often dictates the need for portable skill credentials, particularly in service and health-related industries.

In contrast, the question of portability of student certification in education brings up the issue of local versus state or national control. Education and training in the U.S. is highly decentralized and does not lend itself readily to a top-down approach typically required to ensure portability. States and localities currently have the power to determine for themselves what students should know and be able to do. Hence, the status quo is characterized by a myriad of state and local student assessment systems. However, if the goal is for STW certification to be portable across states and regions, some degree of local flexibility may need to be sacrificed. Moreover, models exist for national assessment efforts, such as the National Assessment for Educational Progress (NAEP) which as been regularly conducting assessments of the nation's students since 1969. However, NAEP does not represent a fully developed model for STW certification since it does not report individual scores.

Summary of Comparison

The comparison of education and work place skill assessment with respect to key assessment issues is summarized in Table 1. Because the two worlds of assessment must be connected in a comprehensive STW assessment, the similarities and differences between the two must be considered. If not, the differences between education and the workplace can certainly threaten the development of a viable STW assessment system. The next section speaks to the conditions that must exist to help bridge these differences and pave the way for successful implementation of a comprehensive STW assessment system.

TABLE 1
Comparison of Education vs
Workplace Skill Assessment

	School Based	Work Based
Standards	Academic	Industry
Accountability	Future oriented: Ensure readiness for next educational level	Present oriented: Screen out unqualified; Select qualified
Multiple Measures	Multiple-choice assessment Open-ended response tasks Portfolios	Multiple-choice assessment Open-ended response tasks Work samples and simulations
Validity/ Legal Defensibility Focus	Opportunity to learn Curricular alignment Consequential validity Equity	Job relevance Predictive validity Equity
Policy Driver	Public Support	Market Support
Who Pays?	Public	Industry Individual
Focus on Portable Credentials	No	Yes

Conditions for Successful Implementation of a STW Assessment System

Successful implementation of a STW assessment system entails significant changes to the status quo. The conditions needed to bring about and sustain such changes include: structural changes, mandates to support STW assessment, and technical support.

Structural Changes

Although seemingly self-evident, the major structural prerequisite for an effective STW assessment system is a sustainable, comprehensive STW system. In turn, a STW assessment system would help strengthen and expand an overall STW system. Unfortunately, in many states the infrastructure to support a STW assessment system is not yet in place. Specifically, a STW assessment system needs the structural support

afforded by several key STW programmatic features, including an education-industry partnership, professional development opportunities for teachers and industry representatives, integrated curriculum, as well as other school-based and work-based components.

The education-industry partnership must include policy- and decision-makers from both sectors. Only with commitment from the highest levels is it possible to make the significant structural changes needed to support a STW assessment system as well as other key components of a comprehensive overall STW system. The education-industry partnership should also encompass practitioners, providing a forum for teachers and industry representatives to develop assessment tasks collaboratively, as alluded to earlier in this paper. Participating teachers and industry representatives (e.g., work-site supervisors of students in paid and unpaid internships) would need substantial professional development to prepare them for designing assessment tasks, administering these tasks, and ensuring alignment of classroom/work-based activities with the assessment tasks. Finally, integrated curriculum that blends academic and professional-technical education and incorporates career-related learning must be in place so that students have the opportunity to learn the academic and professional-technical skills the assessment tasks are designed to measure. For a STW assessment system to be valid and legally defensible, it should be aligned to an integrated curriculum that exposes students and work candidates to the skills that they will be held accountable for in the workplace.

Mandates to Support STW Assessment

The STW programmatic features described above represent significant changes to traditional delivery of education and training. Indeed, STW is not business as usual. The substantive changes needed to support an over STW system, in general, and a STW assessment system, in particular, require strong incentives, including explicit mandates. Without such mandates, change can be slow, or worse, indefinitely stalled. California's Career-Technical Assessment Program (C-TAP) provides an example of an innovative STW assessment model that is available to California high schools to assess and certify vocational students for proficiency on important career-technical and related academic standards (Rabinowitz, 1997). Use of this system in the state remains low to a large extent because there has not been a state or local mandate to incorporate the system as part of an overall STW program or system. This situation is likely to change since California was recently awarded a STW implementation grant under the School-to-Work Opportunities Act (STWOA). The grant should provide a necessary lever for California to support STW assessment leading to formal skill certificates.

There are other mandates besides those afforded by the STWOA that should drive development of a viable STW assessment system, such as the aforementioned Certificates of Initial and Advanced Mastery (CIM/CAM). First called for by the Oregon Educational Act for the 21st Century (1991), Oregon's State Board of Education adopted the new standards for CIM and CAM in 1996. Requirements for the Certificate of Advanced Mastery, in particular, represent the fiat for development of a STW

assessment system by calling for achievement of grade 12 state performance standards in career-related learning standards (e.g., personal management, problem solving, teamwork, etc.) and academic content areas (e.g., English, mathematics, science, social sciences, second language) as well as participation in a broad grouping of related careers (Arts and Communications, Business and Management, Health Services, Human Resources, Industrial and Engineering Systems, Natural Resource Systems). Further driving the development of a STW assessment system is the optional endorsement credential currently under development that will be awarded to students who complete in-depth career-related study (Oregon Department of Education, 1997).

Industry mandates could also help "jump start" the adoption of a STW assessment system. If industry formally recognizes STW skill certificates and sends out the word that they intend to hire those with such certificates, assessment would become a priority for the emerging STW partnerships. Finally, formal adoption by a state or locality of the national skill standards for one or more industries could also serve as an effective incentive or mandate for development of a STW assessment system.

Technical Support for Change

As with any new or innovative assessment system, technical issues often threaten full implementation. Thus, low reliability and generalizability are often advanced as technical flaws in new predominantly performance-based assessment systems (Koretz et. al., 1992; Stecher et. al., 1997). Likewise, combining scores across varied assessment tasks to make a certification decision as well as equating of evolving assessments across years pose challenges to the technical adequacy of a STW assessment system.

Although the technical challenges are real, there is evidence that many technical issues can be resolved through structural changes. For example, several recent studies show that reliability of performance-based assessments increase to acceptable levels through adequate training of scorers on well-defined rubrics (Baker, 1992; Shavelson, Baxter, and Gao, 1993). The experience in Kentucky with its statewide writing portfolio has shown significant improvements in scorer reliability through establishment of a statewide network of cluster leaders who work with local teacher/scorers. Kentucky's experience clearly demonstrates that innovative assessment systems, (such as a STW assessment system), entail increased technical requirements, and hence, require concerted professional development of teachers and industry representatives to meet these challenges.

Concluding Remarks

Clearly, much work needs to be done to pave the way for the development of comprehensive STW assessment systems. Nonetheless, efforts have begun. Although still very much in its infancy stage, the groundwork is being laid to develop STW assessments and portable skill certificates. At the national level, the National Skill Standards Board (NSSB) is providing support to national partnerships that are

collaborating on standards and assessment work. One of these efforts, the National Skill Standards and Assessment Collaborative (NSSAC) is a partnership among four diverse industries (electronics, health care, human services, and retail) to develop and pilot-test assessments that apply across industries, including work place and educational settings. Preliminary findings from this project indicate that written scenarios and portfolios hold promise as assessment tools that are applicable across various industries and educational settings. At the same time, findings suggest significant differences in conceptions of what constitutes viable assessment methodologies. For example, employers participating in this study expressed strong preferences for written scenarios that are tailored to specific industry contexts and jobs in contrast to many educators who favored less occupationally specialized scenarios. Moreover, employers' general stance towards portfolios is "slim is better" as compared with educators who tend to work with more expansive portfolios. Many of the observations described in this paper grew out of this particular effort which was directed by the present author.

Among the other pioneering efforts to develop STW assessment systems are multiple-state consortia supported through the NSSB's and National School-to-Work Office's "Building Linkages" initiative to establish partnerships that link academic and industry skill standards, develop common career pathways, and begin design of portable skill certificates. Three "Building Linkages" projects are underway, one focusing on health care, another on manufacturing, and a third on business and management.

As these national and multi-state efforts begin to make strides alongside individual state and local STW efforts, it becomes increasingly clear that significant resources are needed to make structural changes, establish clear mandates, and provide the technical support to enable successful implementation of STW assessment systems. Above all, however, education-industry partnerships need the will to make it happen.

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